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Journal club

Ambulatory management of primary spontaneous pneumothorax

Commentary on:
Hallifax RJ, *et al*. Ambulatory management of primary spontaneous pneumothorax: an open-label, randomised controlled trial. *Lancet* 2020; 396: 39–49.

Context

The management of primary spontaneous pneumothorax (PSP) is currently being debated. The British Thoracic Society (BTS) guidelines [1] are over a decade old and recent European Respiratory Society (ERS) guidance [2] summarises more up-to-date evidence. Needle aspiration, intercostal drain insertion (ICD) and observation are all advocated. Ambulatory pneumothorax management has been described for decades [3]. A systematic review of underpowered and nonrandomised trials suggested a need for high quality data to support the use of ambulatory devices in pneumothorax management [3]. Thus, the Randomised Ambulatory Management of Primary Pneumothorax (RAMPP) trial was devised [4]. The trial aimed to compare the length of hospitalisation and safety of ambulatory management with standard care (needle aspiration±ICD insertion) [5]. We aim to describe the outcomes of RAMPP. We discuss its general relevance and in the context of the recent trial favouring conservative management over an interventional approach in PSP [6].

Methods

RAMMP was a multicentre, open-label, randomised controlled trial (RCT). It was conducted in the UK across 24 centres. 776 patients were screened and 236 were randomised on a 1:1 basis to either ambulatory care with a Rocket Pleural Vent (PV) (Rocket Medical plc., Watford, UK), or standard care as per BTS guidance and as described above. Reasons for exclusion were: 158 presented out of hours or when no trained staff were available, and 60 had been treated already making them ineligible. 101 refused consent and 192 were deemed to not require intervention and so were recruited to a separate observational study. Randomised participants were 16–55 years old, had a PSP of >2 cm and/or significant symptoms. Patients could be included if they had well-controlled asthma or a previous pneumothorax. Existing lung disease, a smoking history of >20 pack-years, tension pneumothorax, pregnancy and lactation, or a contraindication to any thoracic procedure were sensible exclusion criteria. Patients who had had an unsuccessful needle aspiration could still be recruited within 24 h if they remained hospitalised.

If the lung was insufficiently inflated (defined as >1 cm air visible on chest radiograph) at 1–2 h after PV insertion, the patient was discharged with the PV *in situ*. Upon further review, an ICD would be inserted if re-expansion was insufficient. In the standard care arm, clinicians either performed

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Table 1 *Summary of primary and secondary outcomes*

	Ambulatory care group (n=117)	Standard care group (n=119)	p-value
Primary outcome			
Total hospital stay within 30 days after treatment (days)	0 (0–3)	4 (0–8)	<0.0001
Total hospital stay within 30 days after treatment by worst-case scenario analysis (days)	1 (0–6)	4 (0–8)	0.0057
Secondary outcomes			
Patients requiring additional pleural procedure	24/114 (21%)	42/113 (35%)	0.0075
Ipsilateral recurrence within 12 months	28 (24%)	33 (28%)	0.215
Time off work (days)	10.7±11.9	11.5±13	
Serious adverse events	14 (12%)	0	<0.0001

Data are presented as median (interquartile range), mean±SD or n (%), unless otherwise stated.

needle aspiration or could proceed straight to ICD insertion with or without the use of suction. Set discharge criteria for both arms were patient agreement, stable observations, no radiological increase in the size of pneumothorax and no requirement for any respiratory support. The patients also had to be mobile, self-caring, and living with a responsible person. Clear safety nets were provided. Surgical referral was considered on day 4 of continued air leak in either arm. Patients were seen regularly during their intervention period and then at 7 days, 30 days, 6 months and 12 months.

The primary outcome of RAMPP was the total hospital stay up to 30 days after initial presentation. Secondary outcomes included need for extra pleural procedures, adverse events, pain and breathlessness scores, recurrence rates and time off work. Previous data had suggested that most PSPs resolve by 14 days with nonsurgical, conservative management [7] and thus the 30 day point was thought to be reliable to assess for any re-admissions.

Main results

117 were randomised to the ambulatory care arm and 119 to the standard care arm (total recruitment 236). Both groups had similar baseline characteristics, and most patients were symptomatic (90% had chest pain, 89% had breathlessness). Patients with missing data at 30 days were excluded from the analysis of the primary outcome (three patients in the ambulatory group and six in the standard care group).

The primary outcome, total hospital stay within 30 days, was 0 days (IQR 0–3) for ambulatory management and 4 (IQR 0–8) for standard care (p<0.0001; median difference 2 days, 95% CI 1–3). This statistically significant difference was maintained in the worst-case scenario analysis to account for missing data (table 1).

24 out of 114 patients in the ambulatory care group required an additional pleural procedure compared with 42 out of 113 in the standard arm (table 1). Both groups had comparable reduction in mean pain and breathlessness visual analogue score (VAS) scores at days 0–4. There was no statistically significant difference between recurrence rate of ipsilateral pneumothorax at 12 months and the groups did not differ with regards to time off work (table 1).

110 out of 236 (47%) patients had adverse events (64 out of 117 (55%) in the ambulatory care arm *versus* 46 out of 119 (39%) in the standard care arm). 97 (39%) patients had intervention-related or treatment-related adverse events. Frequent nonserious adverse events were pain on insertion, bleeding, surgical emphysema and failure of the device. Serious adverse events only occurred in the ambulatory group (14 out of 117; 12%). These are summarised in table 2.

Commentary

The RAMPP trial is the first RCT to provide large-scale evidence on the safety and efficacy of ambulatory devices in the management of PSP.

It is a well-conducted study, with a pragmatic design and practical exclusion criteria. The patient characteristics in the studied groups are well balanced, with high symptomatology and missing data were accounted for in the worst-case scenario analysis. The results show that ambulatory management of PSP can significantly reduce hospital stay but is associated with a marginally longer time to completion of initial treatment (median 3 days (interquartile range (IQR) 1–6) *versus* 2 days (IQR 0–6); p=0.0040).

There was a significantly higher rate of adverse events in patients managed in the ambulatory

setting. However, the total hospital stay remained lower in patients receiving ambulatory care (0 days (IQR 0–3) *versus* 4 days (IQR 0–8); p<0.0001). Approximately 3000 patients per year in the UK develop PSP and more than half require ICD and hospitalisation with a mean duration of hospitalisation of 6–8 days [3]. Additionally, the ambulatory group required less pleural interventions (21%) than the standard group (35%). A higher proportion of standard care patients needed further pleural procedures (not reaching statistical significance) driven by the 38 (32%) people who needed a drain after needle aspiration. These findings should be highlighted at the time of patient consent, prior to insertion of the PV, to make any intervention patient centred.

The open-label design of the study makes it susceptible to a degree of confirmation bias, though this is likely to affect both study groups. Caution while using a new device may have contributed to longer initial treatment times in the ambulatory group. Proceeding directly to ICD without needle aspiration in some patients in the standard care arm will also have affected admission numbers. A *post-hoc* analysis excluded those patients and showed no change in the length of stay (median 3 days (IQR 0–8) in patients with needle aspiration, median difference 1 (95% CI 0–3); p=0.0001). The decision to discharge remains an inherently subjective process, although the prespecified criteria for discharge, as outlined in the methods, helped to balance the approach in both groups.

The pragmatic design of the trial has made it a valuable source of evidence for ambulatory management in routine practice. Its patient recruitment, confined to between 09:00 and 17:00, and exclusion of 83 patients, who presented when no trained staff were available, highlighted the importance of a robust setup with specialist respiratory services in centres using ambulatory devices. Although this could contribute to a selection bias, with patients presenting out of hours possibly displaying different characteristics, it realistically represented the patients to whom ambulatory treatment would most likely be offered.

The RAMPP trial provides evidence for ambulatory management of PSP which may seem to contrast the conservative approach described by Brown *et al.* [6]. Their patient population, however, was quite different. 89% of patients in both arms of RAMPP reported breathlessness, with initial VAS scores between 40 and 45. The mean Borg dyspnoea index for patients studied by Brown *et al.* [6] were 1.7±1.4 and 1.2±1.2 in the conservative and interventional arms, respectively. The patients' smoking history, which is one of the main predictors of pneumothorax recurrence, also differed significantly between the two trials, with more current and ex-smokers in the RAMPP study (67.6% *versus* 56.8%). Furthermore, RAMPP's pragmatic inclusion criteria make the findings more easily applicable to daily practice.

Table 2 *Serious adverse events*

	Ambulatory care group (n=117)	Standard care group (n=119)
Related to treatment		
Enlarging pneumothorax	4 (3%)	0
Device blocked/kinked	2 (2%)	0
Dislodged device	1 (1%)	0
Re-expansion pulmonary oedema	1 (1%)	0
Device leakage	1 (1%)	0
Admission for suction	1 (1%)	0
Unrelated to treatment		
Unrecognised haemopneumothorax	3 (3%)	0
Pleurisy	1 (1%)	0

Implications for practice

Within the constraints of its limitations, the RAMPP trial has offered valuable evidence to aid the future development of management pathways. While conservative management may be appropriate in a highly selected patient group, as Brown *et al.* [6] suggested, those who present with significant breathlessness due to a PSP or who have failed conservative management can now be offered an ambulatory management option. The RAMPP trial screened 776 patients and recruited 236, and as explained above, dropouts were due to patient refusal, out-of-hour presentations and inexperienced staff. Hallifax *et al.* [4] note that there is thus an urgent need to develop robust pathways to offer such a management option which would include trained staff, close follow-up, thorough safety netting and ability to deal with complications when they arise. We wholeheartedly agree. This is furthermore reflected in the BTS guidance for pleural work during the COVID-19 pandemic where ambulatory pneumothorax management is suggested [8]. Jones *et al.* [9] presented a service set-up through a local ambulatory care service, which required strong engagement from emergency physicians, acute medicine and respiratory departments and caters for out-of-hours patients. Treatment of PSP in an ambulatory setting will reduce hospital admissions and there is some emerging evidence about this [9, 10]. Of note, there is recent evidence from a randomised trial in secondary pneumothorax (SSP) which failed to prove the null hypothesis of ambulatory drains reducing the length of stay in SSP [11]. Further discussion is beyond the scope of this article, but attests to the fact that the exact management of any type of pneumothorax is still not fully evidence based and agreed upon.

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Conflict of interest

None declared.

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